

Investigating the Effects of Photography on Recall

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Abstract

The photo-taking-impairment effect is when memory is hindered by the act of taking photos. Henkel established this effect for memory recognition only, and subsequent work primarily uses simulated photography tasks with stimuli from museums. To gain more clarity on effects of photography on memory recall, we conducted an experiment to reproduce Henkel’s findings. Participants observed objects individually arranged around a large room, photographed some of them, and after a break listed the objects they remembered. When they took photos, they could recall 14% fewer objects than just observing it, confirming the existence of a photo-taking-impairment effect for recall.

CCS Concepts

• Human-centered computing → Empirical studies in HCI.

Keywords

photography, controlled experiments

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1 Introduction

People frequently take photos to remember important moments, yet paradoxically, research in psychology suggests that taking photos can impair memory. This phenomenon, known as the *photo-taking-impairment effect* [8], posits that taking a photo causes people to rely on the camera as an external ‘memory storage’ and dissuades people from encoding important moments in their own memory [11, 18]. The photo-taking-impairment effect was originally established with a realistic task, where participants photographed items in a museum [8]. However, reproductions of the effect often have participants viewing and photographing art pieces on a computer screen (e.g., [12, 16–18]), which provides additional experimental control and is easier for researchers to reproduce, but misses the ecological validity of walking around a physical space.

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Furthermore, reproductions primarily establish the photo-taking-impairment effect through *recognition tasks* (e.g., asking participants to view a few objects and identify which they have seen before [12, 16]). These provide additional cues to assist with memory, such as options in multiple-choice tests [5, p. 154]. This contrasts with *recall tasks*, which provide little or no cues to assist with memory [3]. Recalling something is considered to be more difficult and effortful than recognizing it [1], but is arguably more important as it is frequently used as a ‘starting point’ when remembering something [3] and is commonly used when remembering important life events [5, p. 123]. Some prior work has investigated this, but they group observations with an automatic photography condition [15], making comparisons between observing and photography difficult, or they used tasks that are arguably not conducive for studying recall due to the complexity and similarity of objects that were used [8], or they used an unrealistic experimental task of taking photos of images on a computer screen [12, 16–18].

As photography is increasingly integrated into products and services in a more pervasive ways (e.g., in smartglasses [14] and life-logging [6]), we believe it is important for the HCI community to gain additional clarity on the impacts of photography on recall. We conducted a controlled experiment to reproduce the photo-taking-impairment effect using a recall task. Participants viewed or took photos of 30 everyday objects placed around a large room, then after a distractor task, they were asked to type all objects they remembered in a free recall task. Participants either observed the object or they took a photo using a standard camera application. We believe this task is more accessible for researchers to adopt than a museum set up, more ecologically valid than the display methodology, and allows for a better measure of recall. The results confirmed the existence of a photo-taking-impairment effect with a recall task.

2 Photo-Taking-Impairment Effect

The photo-taking-impairment effect was first established by Henkel in 2014 [8]. Participants were guided to 30 different art pieces in a museum tour and were asked to either view a single art piece for 20 seconds or to take a photo of it using a smartphone. The following day, participants wrote the names (or provided descriptions) of all of the art pieces they remembered to evaluate recall. After, they also completed a recognition task, where they were presented with names and photos of art pieces and asked to indicate whether they had viewed it, taken a photo of it, or if it was not on the museum tour. There were no significant differences in recall, however, participants recognized significantly fewer art pieces that had been photographed than those that had been observed.

The effect has been replicated using another realistic task. Ni-foratos et al. [15] examined the effects of taking a limited number

of photos, taking an unlimited number of photos, not taking any photos, and automatically capturing photos through a wearable camera. Participants walked around a university campus as part of a campus tour, and were asked to recall information about the locations they visited immediately and one week after the tour. The results found no evidence of a photo-taking-impairment effect immediately after the tour, however, one week later, taking a limited and an unlimited number of photos were worse than not taking any photos and automatically capturing photos. However, these two conditions were grouped together for analysis after the fact, making difficult to understand the true differences between taking a photo and observing. Studies by Henkel [8] and Niforatos [15] simulate a realistic photo taking scenario. However, they may be difficult to run in a more controlled environment.

To verify such effects with more experimental control, other researchers have reproduced the findings by having participants view art on a computer. Soares and Storm [16] had participants view images or take pictures of paintings shown on a large display before answering multiple choice questions about the contents of the paintings. Similarly, Lurie and Westerman [12] had participants view images or take pictures of artwork displayed on a desktop application before indicating which artwork they had seen in a multiple choice test and a free recall task where participants wrote details of artworks they remembered. Both of these studies found that participants did worse at remembering information about the artwork when they took photos. However, Soares and Storm only investigated recognition, and both used artificial tasks of viewing art on an external display.

Several studies have investigated other factors that may contribute to the photo-taking-impairment effect. Lurie et al. [11] found the effect extends to screenshots. Another experiment by Soares and Storm [16] found that even when participants knew their photos would be deleted, they still experienced a photo-taking impairment. Yaya et al. [18] and another experiment by Soares and Storm [17] showed that taking multiple photos of the same piece of art can negatively impact recognition. These studies all focused on recognition and used an unrealistic task of viewing and photographing art on a computer. Though simulated viewing of stimulus increases control over the viewing distance and angle [12], it does not represent a more realistic museum experience like Henkel’s task [8].

Despite evidence suggesting the presence of a photo-taking-impairment effect, some prior work has suggested the opposite. Specifically, Barasch et al. [2] conducted an experiment in which participants assigned to a photography condition could choose which artifacts they could photograph in a realistic museum scenario. In a recognition task, they found that participants remembered more visual properties about museum artifacts when they took photos of them. This experiment had high ecological validity, but allowing for participants to choose when to take photos lacks experimental control and limits the ability to isolate the effect of taking a photo.

We believe it is important for the HCI community to gain clarity on the impacts of photography on recall. Most prior work has involved experimental tasks lacking ecological validity, since participants only looked at images of artwork on a screen. We believe that experimental tasks like those used by Henkel and Niforatos

et al. more ecologically valid as they use real camera applications and require participants to move around a physical space to take photos of actual objects or locations. Moreover, we believe that designing a task around recall is preferable over recognition, as it is often the precursor for remembering information and life events [3, 5]. Only Lurie and Westerman [12] found evidence of a photo-taking-impairment effect for recall, but using a computer-based task. Our task approximates that of Henkel, but with more fine-grained control for greater internal validity. This is important to verify given the increased pervasiveness of smartphones and smartphone photography [7].

3 Experiment

To better understand the impact of photography on recall, we conducted a within-subjects experiment. This experiment had two conditions (CONDITION): participants were asked to observe (OBSERVE) or take a photo (PHOTO) of different objects. Participants walked around a large room and observed or took photos of everyday objects placed around the room. After a brief distractor task, they typed the names (or descriptions) of the objects they remembered seeing. *The experimental task is demonstrated in the video figure.*

3.1 Objects

We selected 30 everyday objects, like running shoes, a pillow, and a wallet, to use for the experiment (see Appendix A for images of all objects). In addition to being familiar, common objects, they were also selected to be semantically distinct from each other to prevent higher recollection of similar items (*semantic clustering*) [4]. To assess semantic distinction, the object names were encoded using Word2Vec. Semantic distinction was quantified using cosine distance, which ranges from 0 (identical) to 2 (opposite), with a value of 1 indicating semantically unrelated items. For example, the pair *book–running shoes* would be considered acceptably distinct (distance ≈ 1), whereas a pair like *pencil–pen* would be unacceptably close (distance ≈ 0), due to overlapping meanings and contexts. For the objects we selected, the cosine distances ranged from 0.42 (*coffee cup–measuring cups*) to 1.13 (*matches–paintbrush*), with most having values closer to 1 (MDN = 0.86, IQR = 0.78–0.92), suggesting that our objects had reasonable semantic distinction overall.

With the exception of Niforatos et al. [15], all prior work has used artwork or museum artifacts. This best represents a real-world experience where people would take photos of objects, however, all of these objects have high semantic similarity, making them more difficult to recall, and would be mostly unfamiliar to participants. One advantage of our method for a free recall task is that all objects are easy to describe and are objects participants would see regularly.

The objects were placed around a large 22 m \times 11 m semi-circular room. Each object was approximately 60 cm to 90 cm apart and labeled with a number between 1 and 30 and a name like “running shoes” or “pillow.” The objects were placed in the same position in the room for all participants.

3.2 Apparatus

Participants were given a Google Pixel 3 device running a custom web application (Figure 1). The web application used Node.js, React, and Firebase. The web application created a randomized guided

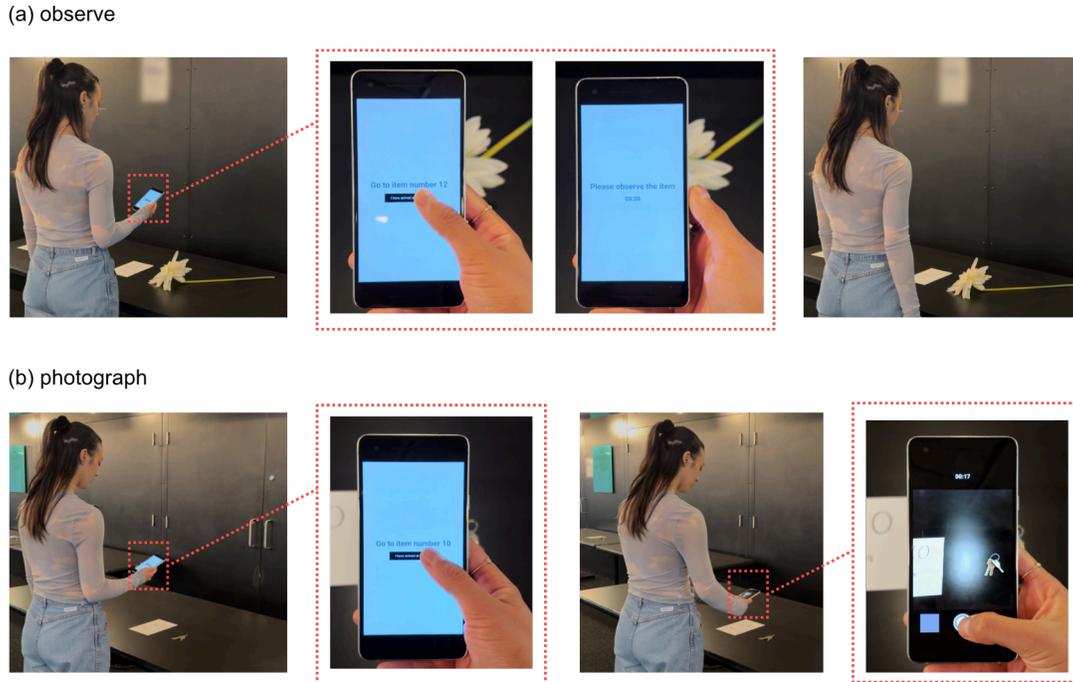


Figure 1: Experimental web application when (a) observing an object and (b) taking a photo of an object. The participant is first guided to a specific object. After indicating that they arrived, they were instructed to observe it or take a photo of it using the web application interface.

tour, controlling the order that participants experienced objects and which experimental condition was applied to each object. First, it would instruct the participant to go to a specific object number and to press a button once they had arrived. Depending on the condition, they could either view the object or take as many photos as they wished using a camera interface. After 20 seconds, the application instructed them to walk to another object. The application logged the photos that were taken for each object.

3.3 Procedure

After entering basic demographic information, the participant received instructions from the facilitator. The participant was informed that they would be tested on their memory of the objects. Then they practiced observing or photographing a “piece of paper,” which was not in the main set. This gave them the opportunity to try the different experimental conditions. Next, the participant began the main experiment. This was a sequence of trials where the web application instructed them to walk to a specific object number and either observe it or take a photo of it based on the experiment condition. The presentation order of the objects and the experimental condition were randomized, meaning all trials for a single condition were interspersed across all objects. After a twenty second viewing time, aligning with prior work [17, 18], the web app instructed them to move to the next object. This pattern continued for all 30 objects. Note each condition was assigned to an equal number of objects (15 each).

After all 30 objects were completed, the participant engaged in a three-minute distractor task presented in the same web application.

This required answering as many simple multiplication problems as possible. The purpose is to mitigate short-term memory effects and has been done in prior work [12, 17]. After the distractor task, the participant completed the free recall task in the same room, but not facing the objects. Participants typed the names or short descriptions of all objects they could remember in a simple unstructured text field. There was no time limit, but in practice participants took less than 10 minutes for the recall task. Finally, they completed a post-experiment survey about their experiences and feedback. The entire session took approximately 45 minutes.

3.4 Measuring Recall

The first and last author independently coded all responses and marked each as recalling an object or not. They were both blind to the specific condition an object was assigned to and both used the following rules.

- An object was recalled if the participant’s response had the same name as the object label, if they used a reasonable alternative name, or if they provided a description that unambiguously referred to the object. For example, a participant would be marked as having recalled the running shoes if they wrote “running shoes,” “Nike shoes,” or “sport shoes.”
- An object was not recalled if the name was ambiguous or the object was not present. For example, a response “brush” is incorrect because there was a paintbrush, a toothbrush, and a comb present.
- An object was not recalled if the response was unsure about the item or too inclusive. For example, the answer “pencil or pen”

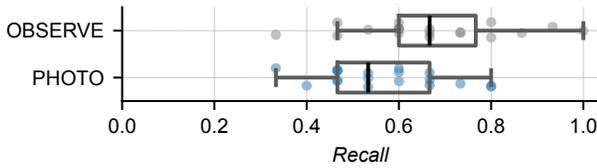


Figure 2: Experiment results by CONDITION for Recall.

would not result in the pencil being marked as recalled because the participant could not recall which item was present.

- If either coder was unsure, they discussed and reached an agreement. For example, some participants listed a “purse” instead of a “wallet” but smaller ‘clutch purses’ resemble wallets, so this was marked as correctly recalled.

Overall, both coders scored the responses similarly in both experiments (Cohen’s κ 0.98 and 0.99). In the main results, we report the results from the second coder, and *include all data in the supplementary materials for increased transparency and reproducibility.*

After coding the responses, *Recall* (0-1 range) was calculated as the proportion of objects assigned to a particular condition that the participants correctly typed.

3.5 Participants

Participants were recruited using an institutional mailing list and word of mouth, and received \$15 for completing the study. To provide additional incentive to do well in the task, participants that performed in the top 25% for the recall task received an additional \$10.

We recruited 22 participants, but three participants (14%) were removed because predictive text on the keyboard assisted their performance on the recall task. This feature was disabled for subsequent participants. This left 19 valid responses, ages 18 to 59 ($M = 29$, $SD = 9.5$), of which 8 self-identified as women and 11 as men. Majority of participants (10, 53%) reported using their phones to take photos daily, 8 (42%) reported doing so weekly, and only 1 (5%) reported doing so monthly.

3.6 Results

We use a Wilcoxon signed-rank test to examine the effect of *CONDITION* on *Recall*. The matched pairs rank-biserial correlation score (RBC), was used to measure effect size.

3.6.1 Recall. Overall, participants recalled 14% fewer items when they took a photo of it (Figure 2). A significant effect of *CONDITION* on *Recall* ($W = 33$, $p = .039$) revealed that *OBSERVE* ($MDN = 0.67$, $IQR = 0.17$) was associated with higher scores than *PHOTO* ($MDN = 0.53$, $IQR = 0.20$). The RBC effect size was 0.57, indicating that there was a large effect of *CONDITION*.

4 Discussion

Overall, we demonstrate a photo-taking-impairment effect using a task that balances realism with experimental control with everyday objects, suitable for measuring recall. We believe that this experimental protocol can be more widely adopted by researchers

wishing to study the photo-taking-impairment effect, especially for recall.

The photo-taking-impairment effect highlights some important concerns for HCI. First, it has direct implications for photo application design and the cultures that grow around them. Photo sharing platforms often encourage constant documentation, yet if photography risks impairing memory, then design choices that promote extensive photo taking may inadvertently undermine the very personal experience such platforms claim to support. Second, the phenomenon matters for HCI’s broader concern with technologies that augment real-life experience. Wearables, AR devices, and life-logging systems similarly promise to enhance presence and recall, but may instead trade genuine engagement for mediated capture. This suggests that the HCI community should investigate how the design of tools meant to enhance our experiences might change how we remember them.

The photo-taking-impairment effect reminds us that augmentation is not neutral: technical mediation can fundamentally alter the cognitive experience of an event. However, it is also possible that alternative camera app designs could mitigate such effects. For example, prior work suggests that requiring users to zoom [8] or record a short audio note [13] can improve recognition and memory, and that interventions that encourage reviewing [10, 13] and even editing [9] photos can improve memory. We believe that the HCI community can make meaningful contributions by designing ways to counter the photo-taking-impairment effect.

4.1 Limitations

Our sample size was smaller than in prior work. However, given our within-subjects design and the large effect sizes that were observed, statistical power was likely sufficient, though a larger and more diverse sample would strengthen the generalizability and robustness of these findings.

Some experimental factors were not tightly controlled. Although condition order was randomized, potential primacy and recency effects were not explored. Participants also self-determined the number of photos taken, which may have introduced variability, as prior work suggests the photo-taking-impairment effect increases with the number of photos captured [18].

Finally, while the study replicates the photo-taking-impairment effect, it does not explore why it occurred (e.g., cognitive offloading vs. attentional disengagement) nor does it examine the persistence of the effect over longer periods of time.

5 Conclusion

We show that taking photos can negatively impact recall using a new experimental protocol that balances ecological validity with experimental control. We hope that our results will encourage more thought around how photography systems impact memory and thoughtful designs that attempt to counter it.

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A Appendix: Objects

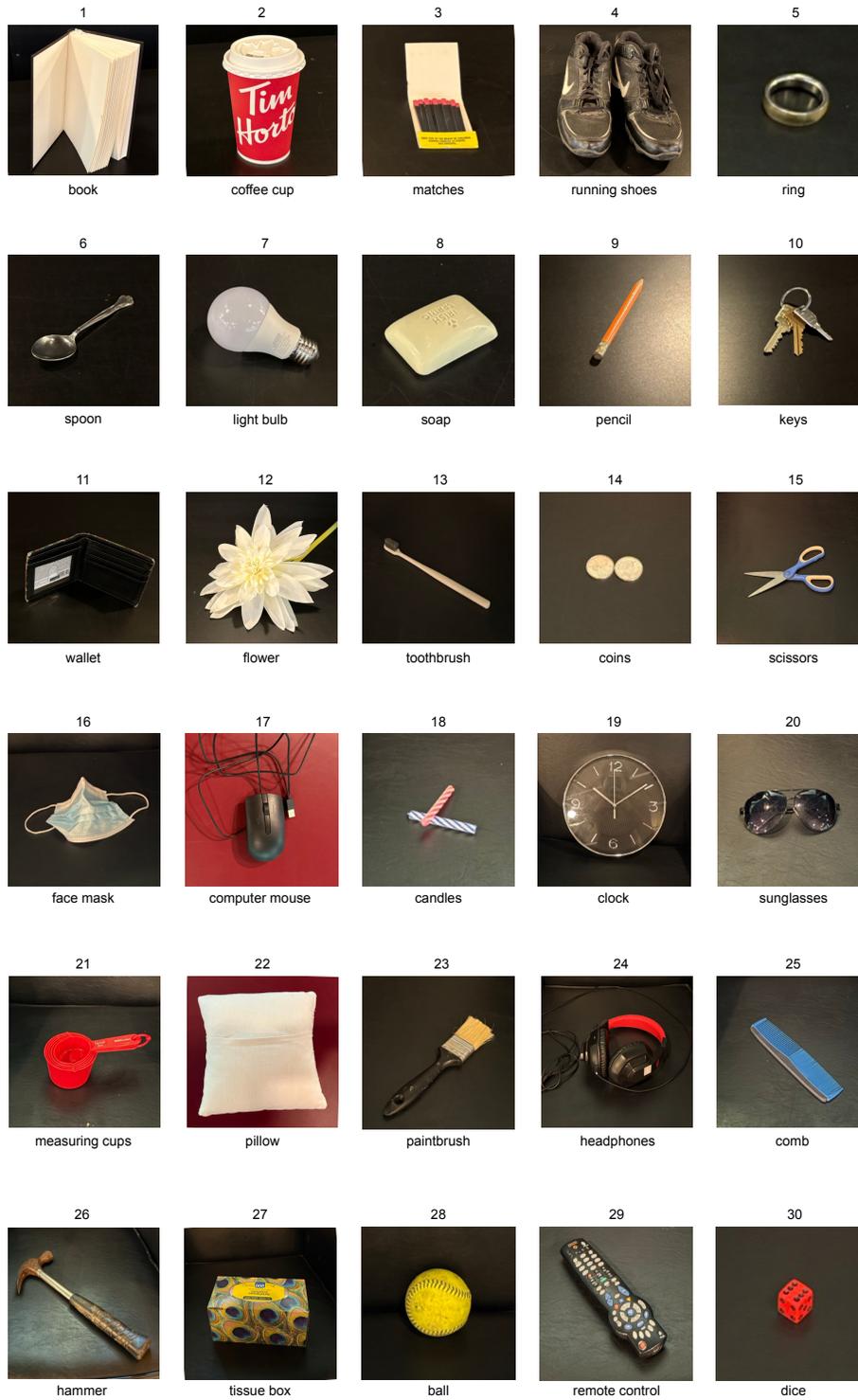


Figure A.1: The objects, object numbers, and names used in the experiment.